Three-Dimensional Time-Resolved Nanomechanical Maps of single Live Cells

Carlos R. Guerrero, Pablo D. Garcia, Ricardo Garcia

Instituto de Ciencia de Materiales de Madrid, CSIC
c/ Sor Juana Inés de la Cruz 3, 28049 Madrid, Spain
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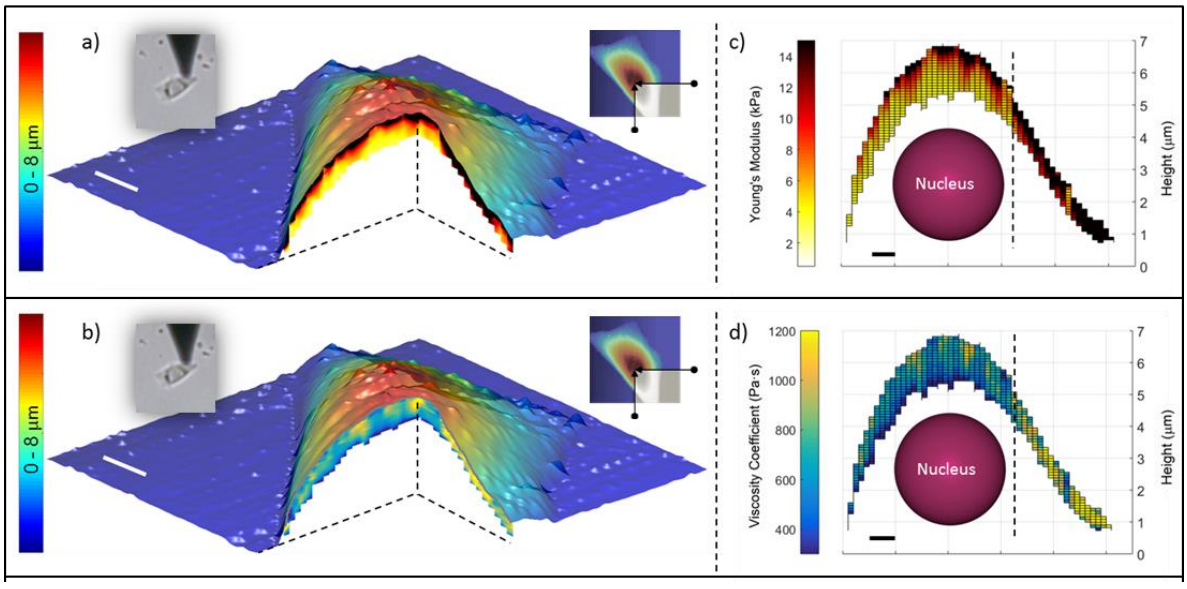
E-mail: c.guerrero@icmm.csic.es

The nanomechanical properties of living cells, such as their internal and surface elastic response and viscosity, have important roles in cellular processes such as motility, metastasis, morphogenesis, cell death and drug delivery [1-2].
Here, we present a novel ***3D nanomechanical method*** to assess the viscoelastic properties of a single cell. The method will enable to determine local features: **Young's Modulus** (E), **Viscosity Coefficient** (η) and **Relaxation Time**. We analyze the behavior of these parameters for a MEF (Mice Embryonic fibroblast), obtaining differences between the nucleus and the cytoplasmic regions of the cell. We find a linear relationship between the elasticity and the viscosity (related to relaxation time).
The 3D method has also been applied to study the dynamic changes of nanomechanical properties taking place under the effect of Cytochalasin-D. The depolymerization of the cytoskeleton decreases E and η values in the whole cell. However, the relative change is significantly larger in the elasticity, which suggests a variation in the relaxation time too.



References

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